PowerEdge R520

Technical Guide

The Dell PowerEdge R520 2-socket, 2U rack server delivers balanced performance and storage expandability for data-intensive applications.

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July 2012 | Rev 1.2

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1 System overview

Introduction

The Dell™ PowerEdge™ R520 is a 2-socket, 2U rack-mount server offering an excellent balance of processing power, storage capacity, and redundancy. The R520's price per performance, configuration flexibility, and headroom for growth make it highly appealing for consolidation and virtualization, web serving and hosting, departmental database applications such as Business Analytics, and a wide range of general purpose collaboration and productivity applications.

Designed for demanding workloads

The extensive memory, storage, and I/O capacities of the R520 make it ideal for consolidation and virtualization. Delivering the performance of two Intel® Xeon® E5-2400 processors and complemented by up to twelve DIMMs, up to four PCI Express® (PCIe) 3.0-enabled slots, and up to eight internal hard drives, the R520 delivers powerful, balanced performance. With built-in redundancy features, the R520 is a trustworthy platform for your business-critical databases and applications. The dense rack form factor and innovative systems management of the R520 allow you to save space and to use your IT administrator's time efficiently.

Manage and secure your data

Features that protect your business data and keep the server running are essential. The extensive storage capacity of the R520 can be protected with both hardware RAID controllers and software solutions to protect your data and ensure that it is readily available. Built-in reliability, availability, and serviceability (RAS) features such as hot-pluggable hard drives and power supplies minimize the need to disrupt production work to take a server offline in the event of a component failure. Redundant, failsafe hypervisors also add an additional layer of protection for virtualized environments.

The PowerEdge server line

The PowerEdge family is engineered with the right combination of features and performance scalability to handle tough workloads for both large and small data center environments.

The Dell OpenManage™ systems management portfolio includes Integrated Dell Remote Access Controller 7 (iDRAC7) with Lifecycle Controller. This embedded feature helps IT administrators manage Dell servers in physical, virtual, local and remote environments, operating in-band or out-of-band, with or without a systems management software agent. OpenManage also integrates and connects to leading third-party systems management solutions you may already own, so you can maintain your single point of control and capitalize on your existing investment. OpenManage simplifies the lifecycle of deploying, updating, monitoring, and maintaining your Dell PowerEdge servers.

New technologies

Table 1 summarizes the newest technologies used in the Dell PowerEdge R520 rack server.

Table 1. New technologies

New technologies	Detailed descriptions
Intel Xeon processor E5-2400 product family	This new family of Intel processors has embedded PCIe lanes for improved I/O performance. See the Processor section for details.
Intel C600 series chipset	The Intel Platform Controller Hub (PCH) chip is implemented on the R520 server.
1600MT/s DDR3 memory	Certain models of the Intel Xeon processor E5-2400 product family support 1600MT/s memory. The R520 supports two DIMMs per channel at 1600MT/s with certain models. See the Memory section for details.
Next generation PERC options	The R520 supports the new PERC controller cards with improved functionality and faster performance. See the Storage section for details.
PERC S110 software RAID Solution	This new software RAID solution supports RAID 0, 1, 5 and 10, and supports a maximum of four hot-plug SATA hard drives or SATA solid-state drives. See the Storage section for details.
iDRAC7 with Lifecycle Controller	The new embedded system management solution for Dell servers features hardware and firmware inventory and alerting, in-depth memory alerting, faster performance, a dedicated gigabit port, and many more features. See the Dell OpenManage systems management section for details.
DC power supply	A new 1100W DC power supply option is available for the R520. See the Power, thermal, and acoustics section for details.
Advanced power management	The R520 supports advanced power monitoring and power capping tools that can help manage power consumption. See the Power, thermal, and acoustics section for details.
Fresh Air cooling	Dell has tested and validated an integrated data center solution that enables you to operate at higher temperatures or even chiller-less. See the Power, thermal, and acoustics section for details.
Failsafe hypervisors	The internal dual SD module enables Dell's unique Failsafe Virtualization architecture, ensuring uptime by providing failover capability for embedded hypervisors, such as VMware® VSphere™ ESXi®. See the Supported virtualization section.
Fan fault tolerance	Failure of one fan motor is tolerated with degradation in performance through active throttling and increased fan speeds. The feature helps reduce downtime by allowing you to schedule a fan replacement within 360 hours of a fan failure.

2 System features

Compared to its predecessor, the R520 supports more PCIe slots, PCIe 3.0, more memory, and advanced systems management. Table 2 compares some of the features of the R520 to its R510 predecessor. Table 3 lists all of the R520's specifications.

Comparison of PowerEdge systems

The R520 is the new generation PowerEdge server replacing the R510. Table 2 compares some of the R520 features to the R510 features.

Table 2. Comparing the PowerEdge R510 to PowerEdge R520

Feature	PowerEdge R510	PowerEdge R520
Chassis	2U rack	2U rack
Processors	Intel Xeon processors 5500 and 5600 series	Intel Xeon processor E5-2400 product family
Internal interconnect	Intel QuickPath Interconnect	Intel QuickPath Interconnect
Memory[1]	8 x DDR3 RDIMM and UDIMM Up to 128GB	12 x DDR3 RDIMM and UDIMM Up to 192GB
Hard drive bays (hot-plug)	Up to 12 x 3.5" or 2.5" SAS/SATA SSD	Up to 8 x 3.5" or 2.5" SAS/SATA SSD
RAID controller	PERC H200, H700, H800	PERC H310, H710, H710P, H810
PCI slots	3 PCIe 2.0 slots	4 PCIe 3.0 slots (with two processors)
Embedded NIC	1 x 1GbE Dual Port LOM	1 x 1GbE Dual Port LOM
Power supplies	Non-redundant 480W AC Hot-plug, redundant and non-redundant 750W AC	Cabled 550W AC Hot-plug, redundant 495W AC, 750W AC, 1100W AC, 1100W DC
Dell OpenManage Systems Management	Dell OpenManage Dell Management Console (DMC) Lifecycle Controller 1.x iDRAC6 (Express or Enterprise) with Lifecycle Controller	OpenManage Essentials Dell Management Console IT Assistant OMSA Agent OpenManage Power Center (requires iDRAC7 Enterprise with Lifecycle Controller) OpenManage Integrations and Connections Basic management (standard option)
Power efficiency	Gold	Platinum
Availability	Hot-plug drives Hot-plug redundant cooling on 12-hard drive configuration Hot-plug redundant power supply units	Hot-plug drives Fan fault tolerance Hot-plug redundant power supply units Internal dual SD module

[1]GB means 1 billion bytes and TB equals 1 trillion bytes; actual capacity varies with preloaded material and operating environment and will be less.

Specifications

Table 3 summarizes the specifications for each of the PowerEdge R520 features. For the latest information on supported features for the PowerEdge R520, visit Dell.com.

Table 3. Technical specifications

Feature	PowerEdge R520 technical specification
Form factor	2U rack
Processors	Intel Xeon processor E5-2400 product family
Processor sockets	2 sockets
Internal interconnect	1 Intel QuickPath Interconnect (QPI) link: 6.4GT/s, 7.2GT/s, 8.0GT/s
Cache	2.5MB per core with core options of 4, 6, or 8
Chipset	Intel C600
Memory[1]	Up to 192GB (12 DIMM slots): 2GB/4GB/8GB/16GB DDR3 up to 1600MT/s
PCIe slots	**3 PCIe slots + 1 storage slot for mini type PERC:** With 2 processors: • 1 x16 slot with x16 bandwidth, 3.0, half-height, half-length • 1 x16 slot with x8 bandwidth, 3.0, full-height, full-length • 2 x16 slots with x8 bandwidth, 3.0, full-height, half-length With 1 processor: • 1 x8 slot with x4 bandwidth, 2.0, half-height, half-length • 1 x16 slot with x8 bandwidth, 3.0, full-height, full-length • 2 x8 slots with x4 bandwidth, 3.0, full-height, half-length
RAID controller	**Internal controllers:** PERC S110 (SW RAID) PERC H310 PERC H710 PERC H710P **External HBAs (RAID):** PERC H810 **External HBAs (non-RAID):** 6Gbps SAS HBA
Hard drives (hot-plug)	**Drive bay options:** Up to 8 x 3.5-inch hot-plug drive bays **Hard drive options:** 3.5-inch SAS (15K), nearline SAS (7.2K), SATA (7.2K) 2.5-inch SAS (15K, 10K), SAS SSD (SLC), SATA SSD (MLC); requires 3.5-inch hybrid tray Self-encrypting drives (SEDs) available
Embedded NIC	Broadcom® 5720 Dual Port 1GbE
Power supply	Auto-ranging, Platinum efficiency, hot-plug redundant 495W or 750W AC PSU Silver efficiency, cabled 550W AC PSU Gold efficiency, hot-plug redundant 1100W DC PSU
Availability	High-efficiency, hot-plug, redundant power supplies; DC power supply, hot-plug hard drives; TPM; dual internal SD support; fan fault tolerance; optional bezel; information tag; ECC memory; interactive LCD screen; extended power range; ENERGY STAR® compliant; switch independent partitioning

Feature	PowerEdge R520 technical specification
Dell OpenManage Systems Management (Agent-free or with OpenManage Server Administrator [OMSA] Agent)	• OpenManage Essentials • Dell Management Console • IT Assistant • OMSA Agent • OpenManage Power Center (requires iDRAC7 Enterprise with Lifecycle Controller) • OpenManage Integrations and Connections: – OpenManage Integration Suite for Microsoft® System Center – Dell Management Plug-in for VMware® vCenter™ – Connections for HP® Operations Manager, IBM® Tivoli® Netcool® and CA Network and Systems Management • Basic management (standard option) – Upgrade to iDRAC7 (Express or Enterprise) with Lifecycle Controller – Upgrade to 8GB vFlash media or 16GB vFlash media for iDRAC7 Enterprise with Lifecycle Controller – Trial evaluations available for IDRAC7 (Express and Enterprise) with Lifecycle Controller
Rack support	• ReadyRails™ II sliding rails for tool-less mounting in 4-post racks with square or unthreaded round holes or tooled mounting in 4-post threaded hole racks, with support for optional tool-less cable management arm • ReadyRails static rails for tool-less mounting in 4-post racks with square or unthreaded round holes or tooled mounting in 4-post threaded and 2-post (Telco) racks
Operating systems	Microsoft Windows Server® 2008 R2 SP1, x64 (includes Hyper-V® v2) Microsoft Windows® Small Business Server 2011 SUSE® Linux® Enterprise Server Red Hat® Enterprise Linux® **Optional embedded hypervisors:** Citrix® XenServer™ VMware vSphere™ Red Hat Enterprise Virtualization® For more information on the specific versions and additions, visit Dell.com/OSsupport.

[1]GB means 1 billion bytes and TB equals 1 trillion bytes; actual capacity varies with preloaded material and operating environment and will be less.

3 Chassis views and features

The Dell PowerEdge R520 is a 2U, 2-socket rack server. For additional system views and features, see the *Dell PowerEdge R520 Systems Owner's Manual* on Support.Dell.com/Manuals.

Chassis views

Figure 1 shows the features on the front of the R520 chassis including eight 3.5-inch hard drives, front control panel, USB connectors, and many other components and features described in this guide.

Figure 1. Front view without bezel

Figure 2 shows the optional lockable bezel on the front of the R520 chassis.

Figure 2. Front view with bezel

Figure 3 shows the features on the back panel of the R520 including USB connectors, Ethernet connectors, serial connector, video connector, PCIe slots, power supplies, and many other components and features described in this guide.

Figure 3. Back view

The chassis design of the R520 is optimized for easy access to components and for airflow for effective and efficient cooling. The R520 supports up to 12 DIMMs, 2 processors, hot-plug redundant power supplies, and many other components and features described in this guide.

Figure 4. Internal view

Chassis features

Table 4 lists the features on the R520 chassis. For additional information, see the *Dell PowerEdge R520 Systems Owner's Manual* on Support.Dell.com/Manuals.

Table 4. Chassis features

Feature	Description
Power button	ACPI-compliant power button with an integrated green power LED
Front bezel	Covers the system's front-loading hard drives and locks for security
NMI button	Used to troubleshoot software and device driver errors; use only if directed to do so by qualified support personnel or by the operating system's documentation
System identification button	Buttons on the back and front of a system to help identify the unit in a data center environment
Hard drives	Up to eight 3.5-inch drives
USB connectors	Connects USB devices to the server
Information tag	Slide-out label panel for recording system information
Video connector	Connects a monitor to the server
LCD panel and buttons	Displays system ID, status information, and system error messages; two navigation buttons to scroll through the menu on the LCD and one select button
Optical drive	Optional slim DVD or DVD+RW drive
Power supply units	Supplies power to the server
Power supply indicators	Indicates whether server has power
NIC indicators	Indicates network activity and status
PCIe slots	Connects PCIe expansion cards to the server
Ethernet connectors	Connects integrated 10/100/1000 NICs to the server
Serial connector	Connects a serial device to the server
iDRAC7 Enterprise port	Dedicated management port for optional iDRAC card

Front control panel

The R520 control panel is located on the front of the chassis as shown in Figure 5. For more information about the LCD control panel, see the *Dell PowerEdge R520 Systems Owner's Manual* on Support.Dell.com/Manuals.

Figure 5. LCD control panel

Quick Resource Locator

A useful feature included with Dell PowerEdge 12th generation servers is the Quick Resource Locator (QRL)—a model-specific Quick Response (QR) code that is located inside the R520 chassis cover (see Figure 6). Use your smartphone to access the Dell QRL app to learn more about the server.

Figure 6. QRL location

This QRL code allows you to:

- View step-by-step videos, including overviews of system internals and externals, as well as detailed, concise, task-oriented videos and installation wizards
- Locate reference materials, including searchable owner's manual content, LCD diagnostics, and an electrical overview
- Look up your service tag so you can quickly gain access to your specific hardware configuration info and warranty information
- Contact Dell directly (by link) to get in touch with technical support and sales teams and provide feedback to Dell

These codes provide an easy way to retrieve the critical support information you need when you need it, making you more efficient and effective in managing your hardware.

Security features

The latest generation of PowerEdge servers has the features listed in Table 5 to help ensure the security of your data center.

Table 5. Security features

Security feature	Description
Cover latch	A tooled latch is integrated on the top cover with a coin key lock to secure the system.
Bezel	An optional metal bezel is mounted to the chassis front to provide the Dell ID. A lock on the bezel is used to protect un-authorized access to hard drives. System status is viewable on the LCD screen when the bezel is installed.

Security feature	Description
TPM	The Trusted Platform Module (TPM) is used to generate/store keys, protect/authenticate passwords, and create/store digital certificates. It also supports the Intel Xeon TXT functionality. TPM can also be used to enable the BitLocker™ hard drive encryption feature in Windows Server 2008. TPM 1.2 is supported. No TPM version is available for China or Russia.
Power-off security	BIOS has the ability to disable the power button function.
Intrusion alert	An internal switch is used to detect chassis intrusion.
Secure mode	BIOS has the ability to enter a secure boot mode through system setup. This mode includes the option to lock out the power and NMI switches on the control panel or set up a system password.

4 Processor

The Dell PowerEdge R520 features the Intel Xeon processor E5-2400 product family, which offers an ideal combination of performance, power efficiency, and cost. These processors provide high performance no matter what your constraint is—floor space, power, or budget—and on workloads that range from the most complicated scientific exploration to crucial web-serving and infrastructure applications. In addition to providing raw performance gains, improved I/O is also made possible with Intel Integrated I/O, which can reduce latency by adding more lanes and doubling bandwidth. This helps to reduce network and storage bottlenecks, unleashing the processor's performance capabilities.

Processor features

The new Intel Xeon processor E5-2400 product family provides the following features:

- 2-socket processor design with power and dimensions optimized for density
- Up to 8 execution cores per processor
- Intel Hyper-Threading technology enables up to 16 computational threads
- Micro-architecture on 32nm process for greater performance per watt
- Support for more memory—4 additional DIMMs (up to 12 DIMM slots) and support for up to 16GB DIMMs increasing the memory capacity from 128GB to 192GB
- Integrated memory controller with 3 channels of DDR3 and 46-bit physical addressing facilitate greater memory capacity
- Intel Integrated I/O has support for up to 48 lanes (24 lanes per socket) of PCIe 3.0 links capable of 8.0GT/s
- Faster connections throughout the system with support for DDR3 1600MT/s memory and 8.0GT/s QPI
- Intel Data Direct I/O (DDIO) allows I/O traffic to skip the main system memory and be directed straight to the processor cache, which can provide a significant reduction in latency as well as allowing memory to remain in a low-power state
- High bandwidth, low latency, bidirectional ring interconnect allows faster access to the 20MB multi-banked last level cache
- Intel Advanced Vector Extensions offer up to double the floating point operations per clock cycle by doubling the length of registers, which can be useful for addressing very complex problems or dealing with large-number calculations, which are integral to many technical, financial, and scientific computing problems
- Intel Turbo Boost Technology 2.0, which allows processor cores to run faster than the base operating frequency if it's operating below power, current, and temperature specification limits, delivers up to double the boost than the previous generation
- Continued improvements to both Intel TXT and AES-NI help to better protect systems and data

For more information on the Intel Xeon processor E5-2400 product family, visit Intel.com.

Supported processors

Table 6 lists the Intel Xeon processors supported by the PowerEdge R520. For the latest information on supported processors, visit Dell.com/PowerEdge.

Table 6. Supported processors

Model	Speed	TDP	Cache	Cores/ threads	QPI	Turbo
E5-2470	2.3GHz	95W	20MB	8/16	8.0GT/s	Yes
E5-2450L	1.8GHz	70W	20MB	8/16	8.0GT/s	Yes
E5-2450	2.1GHz	95W	20MB	8/16	8.0GT/s	Yes
E5-2440	2.4GHz	95W	15MB	6/12	7.2GT/s	Yes
E5-2430L	2.0GHz	60W	15MB	6/12	7.2GT/s	Yes
E5-2430	2.2GHz	95W	15MB	6/12	7.2GT/s	Yes
E5-2420	1.9GHz	95W	15MB	6/12	7.2GT/s	Yes
E5-2407	2.2GHz	80W	10MB	4/8	6.4GT/s	No
E5-2403	1.8GHz	80W	10MB	4/8	6.4GT/s	No

For information on processor installation and configuration, see the *Dell PowerEdge R520 Systems Owner's Manual* on Support.Dell.com/Manuals.

Chipset

The Intel C600 chipset is implemented on the PowerEdge R520. For more information, visit Intel.com.

5 Memory

More options are available for the Dell PowerEdge 12th generation servers than in previous generations—more capacity choices and more frequency choices. The PowerEdge R520 supports up to 192GB of memory with speeds of up to 1600MT/s, providing high performance in a variety of applications. The new reliability, availability, serviceability (RAS) features like memory mirroring and sparing help you increase your uptime and reduce data loss. RAS aids in the rapid and accurate diagnosis of faults that require service, increasing your memory reliability.

Supported memory

The R520 supports the memory technologies shown in Table 7.

Table 7. Memory technologies supported

Feature	UDIMM	RDIMM
Register	No	Yes
Buffer	No	No
Frequencies	800, 1066, or 1333MT/s	800, 1066, 1333, or 1600 MT/s
Ranks supported	1 or 2	1, 2, or 4
Capacity per DIMM	2 or 4 GB	2, 4, 8, or 16 GB
Maximum DIMMS per channel	2	3
DRAM technology	x8	x4 or x8
Temperature sensor	Yes	Yes
ECC	Yes	Yes
SDDC	Yes (with advanced ECC mode)	Yes
Address parity	Yes	Yes

The R520 supports the DIMMs listed in Table 8. For the latest information on supported memory, visit Dell.com.

Table 8. DIMMs supported

Capacity (GB)	Speed (MT/s)	Type	Ranks per DIMM	Data width	SDDC support	Voltage
2	1333	RDIMM	1	x8	Advanced ECC	1.35
2	1333	UDIMM	1	x8	Advanced ECC	1.35
2	1600	RDIMM	1	x8	Advanced ECC	1.5
4	1333	RDIMM	2	x8	Advanced ECC	1.35
4	1333	RDIMM	1	x4	All modes	1.35
4	1333	UDIMM	2	x8	Advanced ECC	1.35
4	1600	RDIMM	2	x8	Advanced ECC	1.5
8	1333	RDIMM	2	x4	All modes	1.35
8	1600	RDIMM	2	x4	All modes	1.5
16	1333	RDIMM	2	x4	All modes	1.35
16	1600	RDIMM	2	x4	All modes	1.5

Memory configurations

Flexible memory configurations are supported on the R520, ranging from capacities of 2 GB to 192 GB. The system supports up to 6 DIMMs per processor (up to 12 DIMMs in a 2-processor configuration). The R520 has 3 memory channels per processor, with each channel supporting up to 2 DIMMs.

The R520 supports a flexible memory configuration according to these basic rules:

- Speed: If DIMMs of different speeds are mixed, all channels across all processors operate at the slowest DIMM's common frequency.
- DIMM type: Only one type of DIMM can be used in a system. UDIMMs and RDIMMs cannot be mixed.

The following additional memory population guidelines apply to the R520:

- Up to two quad-rank (QR), dual-rank (DR), or single-rank (SR) DIMMs may be populated per channel.
- DIMMs must be installed in each channel, starting with the DIMM farthest from the processor.
- DIMMs should be installed with largest rank count to smallest. For example, if DR DIMMS are mixed with SR DIMMs, DR DIMMS should be placed in the lowest DIMM slots, followed by the SR DIMMs.

For more information on memory configuration, see the *Dell PowerEdge R520 Systems Owner's Manual* on Support.Dell.com/Manuals.

Memory speed

The R520 supports memory speeds of 1600 MT/s, 1333 MT/s, 1066 MT/s, and 800 MT/s depending on the DIMM types installed and the configuration. All memory on all processors and channels run at the same speed and voltage. By default, the systems run at the highest speed for the channel with the lowest DIMM voltage and speed. The operating speed of the memory is also determined by the maximum speed supported by the processor, the speed settings in the BIOS, and the operating voltage of the system.

Table 9 lists memory configuration and performance details for the R520 based on the population of the number and type of DIMMs per memory channel.

Table 9. Memory speed capabilities

DIMM type	DIMM 0	DIMM 1	Number of DIMMs	Speed (MT/s)			
				800	1066	1333	1600
UDIMM	SR		1	•	•	•	
	DR		1	•	•	•	
	SR	SR	2	•	•	•	
	SR	DR	2	•	•	•	
	DR	DR	2	•	•	•	
RDIMM	SR		1	•	•	•	•
	DR		1	•	•	•	•
	QR		1	•	•		
	SR	SR	2	•	•	•	•
	SR	DR	2	•	•	•	
	DR	DR	2	•	•	•	•
	QR	SR	2	•			
	QR	DR	2	•			
	QR	QR	2	•			

Memory RAS features

Reliability, availability, serviceability (RAS) features help keep the system online and operational without significant impact to performance, and can decrease data loss and crashing due to errors. RAS aids in rapid, accurate diagnosis of faults that require service. Table 10 describes the RAS features supported on the R520.

Table 10. Memory RAS features

Feature	Description
Dense configuration optimized profile	Increased memory reliability can be a result from this selectable platform profile that adjusts parameters to reduce faults regarding refresh rates, speed,

Feature	Description
	temperature and voltage
Memory demand and patrol scrubbing	Demand scrubbing is the ability to write corrected data back to the memory once a correctable error is detected on a read transaction. Patrol scrubbing proactively searches the system memory, repairing correctable errors.
Recovery from single DRAM device failure	Recovery from Single DRAM Device Failure (SDDC) provides error checking and correction that protects against any single memory chip failure as well as multi-bit errors from any portion of a single memory chip.
Failed DIMM isolation	This feature provides the ability to identify a specific failing DIMM channel pair, thereby enabling the user to replace only the failed DIMM pair.
Memory mirroring: intra-socket	Memory mirroring is a method of keeping a duplicate (secondary or mirrored) copy of the contents of memory as a redundant backup for use if the primary memory fails. The mirrored copy of the memory is stored in memory of the same processor socket.
Memory address parity protection	This feature provides the ability to detect transient errors on the address lines of the DDR channel.
Memory sparing (rank)	Memory sparing allocates one rank per channel as a spare. If excessive correctable errors occur in a rank or channel, it is moved to the spare area while the operating system is running to prevent the error from causing an uncorrectable failure.
Memory thermal throttling	This feature helps to optimize power/performance and can also be used to prevent DIMMs from overheating.

For information on memory mirroring and sparing configurations, see the *Dell PowerEdge R520 Systems Owner's Manual* on Support.Dell.com/Manuals.

6 Storage

The Dell PowerEdge R520 supports comprehensive storage options, including different internal and external storage options.

Internal storage

The R520 has one chassis that supports two different drive-bay options:

- 4 x 3.5-inch hot-plug drive option
  - Drive controllers: embedded SATA, PERC S110
  - Non-hot-plug with embedded SATA; hard drive LED on the hard drive tray is disabled
  - Hot-pluggable with PERC S110; hard drive LED on the hard drive tray is enabled
- 8 x 3.5-inch hot-plug drive option
  - Drive controllers: PERC H310, PERC H710, PERC H710P

Both drive-bay options support 2.5-inch and 3.5-inch hard drives and solid-state drives.

Supported hard drives

The R520 supports up to eight 2.5-inch or 3.5-inch hard drives or solid-state drives. Self-encrypting drives (SED) are available. All 2.5-inch drives require the 3.5-inch hybrid tray. Table 11 lists more information about these drives. For additional information, see Dell.com/PowerEdge.

Table 11. Supported hard drives

Form factor	Type	Speed (rpm)	Capacities
2.5″	SAS (6Gb)	10K	300GB, 600GB, 900GB
	SAS (6Gb)	15K	146GB, 300GB
	SAS SSD (SLC, 6Gb)	N/A	200GB, 400GB
	SATA SSD (MLC, 3Gb)	N/A	100GB, 200GB
3.5″	SATA (3Gb)	7.2K	500GB, 1TB, 2TB
	SAS (6Gb)	15K	300GB, 600GB

External storage

External storage for the R520 is available through optional HBAs for SAS, iSCSI, and Fibre Channel. For more information, see Dell.com/Storage.

Storage controllers

Dell provides highly capable RAID options for you to ensure that your data remains safe. Dell's RAID controller options offer impressive performance improvements, including the following features:

- FastPath™ I/O: This feature can help accelerate performance when operating on SSDs.
- Split mirror: This function allows you to break mirrored disk connection in order to quickly replace a drive.
- Physical disk power management (Dimmer Switch™): This feature allows for power control of spare or idle drives, which can save energy and operating expenses.

Supported RAID controllers

The newest line of PERC (PowerEdge RAID Controller) cards offer high I/O performance for database applications and streaming digital media environments. The internal RAID controllers have a dedicated connection to the system board. The R520 supports the new PERC 8 family of controllers with improved functionality and faster performance.

The default PERC for the R520 is a mini-type PERC. The R520 also supports the new software RAID solution that supports RAID 0, 1, 5 and 10. The R520 supports the PERC cards listed in Table 12. For more information about the latest PERC offerings, see Dell.com/PERC.

Table 12. Supported RAID controllers

Controller	Description	Features	RAID modes supported	Form factor	Usage model
PERC H810 External	Eight-port, external 6Gb/s PCIe RAID controller	Includes 1GB NV DDR3 cache, premium performance and feature set, security SED/EKMS, and SSD as cache	0, 1, 10, 5, 50, 6, 60	Adapter	Premium performance
PERC H710P Internal	Eight-port, internal 6Gb/s PCIe RAID controller	Includes 1GB NV DDR3 cache, premium performance and feature set, security SED/EKMS, and SSD as cache	0, 1, 10, 5, 50, 6, 60	Integrated mini-type	Premium performance
PERC H710 Internal	Eight-port, internal 6Gb/s PCIe RAID controller	Includes 512MB NV DDR3 cache, advanced feature set, security SED/EKMS	0, 1, 10, 5, 50, 6, 60	Integrated mini-type	Performance

Controller	Description	Features	RAID modes supported	Form factor	Usage model
PERC H310 Internal	Eight-port, internal 6Gb/s PCIe RAID	Supports hot-plug drives, expansion, pass-through	0, 1, 10, 5, 50	Integrated mini-type	Value
PERC S110 Software RAID	3Gb/s SATA software RAID controller that supports up to 4 physical disks or 8 virtual disks	Supports up to 4 hot-plug SATA drives, no expansion, Microsoft Windows only	0, 1, 5, 10	System board-embedded SATA	Entry-level

CacheCade

CacheCade is a technology that provides automated storage tiering on SSDs with the PERC H810 and H710P. It works by detecting the most often accessed data and copying it over time to the CacheCade SSD(s) where that cached data is accessed directly, instead of accessing the hard disk drives. This can dramatically increase how your applications respond when they are under peak traffic times and how they perform when response time is critical.

CacheCade provides cost-effective performance scaling for database-type applications that perform lots of random reads, and saves the cost of adding extra drives.

Optical drive

The R520 supports one slim, 12.7mm, internal optical drive on the system board embedded SATA. The R520 supports DVD-ROM and DVD+/-RW.

Tape drive

The R520 does not support internal tape drives.

7 Networking and PCIe

The Dell PowerEdge R520 offers balanced, scalable I/O capabilities, including integrated PCIe 3.0 capable expansion slots.

Embedded NIC controller

The R520 system board has one embedded NIC controller. The Broadcom 5720 Gigabit NIC chip is connected to the platform controller hub through a PCIe 2.0 x2 link.

The Broadcom 5720 is a 14th generation 10/100/1000Base-T Ethernet LAN controller solution suitable for high-performance server applications. The Broadcom 5720 combines dual triple-speed IEEE 802.3 compliant Media Access Controllers (MACs) with dual 10/100/1000 Ethernet transceivers (PHYs), selectable individually per port, a network controller-sideband interface (NC-SI) and on-chip memory buffer in a single device. The device provides a PCIe 2.1-compliant interface, which operates at 5GT/s or 2.5GT/s x2 link width.

PCIe expansion

The R520 provides expanded PCIe slot capability over the previous servers. This is made possible by the 24 PCIe lanes available from each processor in the system. Dell designed the R520 to be PCIe 3.0-compliant in order to take full advantage of the processor capabilities.

PCIe slots

The R520 supports up to four PCIe slots. PCIe connectivity is integrated with the processor in that the number of processors in a system impacts the number of PCIe slots and the bandwidth of each PCIe slot. Table 13 lists the slot configurations for the R520.

Table 13. PCIe slot configurations

	One processor	Two processors
PCIe Slot 1	PCIe x8 connector with x4 bandwidth; half-length, half-height, 2.0 (from PCH)	PCIe x16 connector with x16 bandwidth; half-length, half-height, 3.0 (from CPU2)
PCIe Slot 2	PCIe x16 connector with x8 bandwidth; full-length, full-height, 3.0 (from CPU1)	PCIe x16 connector with x8 bandwidth; full-length, full-height, 3.0 (from CPU1)
PCIe Slot 3	PCIe x8 connector with x4 bandwidth; half-length, full-height, 3.0 (from CPU1)	PCIe x16 connector with x8 bandwidth; half-length, full-height, 3.0 (from CPU1)
PCIe Slot 4	PCIe x8 connector with x4 bandwidth; half-length, full-height, 3.0 (from CPU1)	PCIe x16 connector with x8 bandwidth; half-length, full-height, 3.0 (from CPU2)

PCIe expansion cards

The R520 supports a variety of PCIe expansion cards. Table 14 lists the supported add-in NICs and HBAs for the R520.

Table 14. Supported NICs and HBAs

Type	Adapter
1Gb/10Gb NICs	Broadcom 5720 2x1Gb Base-T
	Broadcom 5719 4x1Gb Base-T
	Intel I350 2x1Gb Base-T
	Intel I350 4x1Gb Base-T
	Broadcom 57810S 2x10Gb SFP+
	Broadcom 57810S 2x10Gb Base-T
	Intel X520 2x10Gb SFP+
	Intel X540 2x10Gb Base-T
	QLogic® QLE8262 2x10Gb SFP+
	Brocade® BR1020 2x10Gb SFP+
FC4/FC8 HBAs	QLogic QLE2460 4Gb
	QLogic QLE2462 4Gb
	QLogic QLE2560 8Gb
	QLogic QLE2562 8Gb
	Emulex LPe12000 8Gb
	Emulex LPe12002 8Gb
	Brocade BR815 8Gb
	Brocade BR825 8Gb

For the latest information on all supported add-in PCIe expansion cards for the R520, visit Dell.com.

8 Power, thermal, and acoustics

Lower overall system-level power draw is a result of breakthrough system design. The Dell PowerEdge R520 server maximizes performance per watt through a combination of power and cooling, energy efficient technologies, and tools. Additionally, the PowerEdge R520 has an extensive collection of sensors that automatically track thermal activity, which helps regulate temperature thereby reducing server noise and power consumption.

Power consumption and energy efficiency

With the rise in the cost of energy coupled with increasing data center density, Dell provides tools and technologies to help you realize greater performance with less energy cost and waste. More efficient data center usage can reduce costs by slowing the need for additional center space. Table 15 lists the tools and technologies Dell offers to help you achieve your data center goals by lowering power consumption and increasing energy efficiency.

Table 15. Power tools and technologies

Feature	Description
Power supply units (PSU) portfolio (redundant PSU only)	Dell's PSU portfolio includes intelligent features such as dynamically optimizing efficiency while maintaining availability and redundancy. Find additional information in the Power supply units section.
Tools for right-sizing	**Dell Energy Smart Solution Advisor (ESSA)** is a tool that helps you determine the most efficient configuration possible. With ESSA, you can calculate the power consumption of your hardware, power infrastructure, and storage. ESSA can help you determine exactly how much power your server will use at a given workload, and the PSU Advisor can help you choose the best, most efficient PSU for your workload. Learn more at Dell.com/calc. **Energy Smart Data Center Assessment** is a Dell Services offering that uses infrastructure and thermal analysis to help maximize system efficiency. Learn more at Dell.com/EnergySmart.
Industry compliance	Dell's servers are compliant with all relevant industry certifications and guidelines, including 80 PLUS, Climate Savers, and ENERGY STAR.
Power monitoring accuracy (redundant PSU only)	PSU power monitoring improvements include: • Dell's power monitoring accuracy is currently 1%, whereas the industry standard is 5% • More accurate reporting of power • Better performance under a power cap
Power capping (redundant PSU only)	Use Dell's systems management to set the power cap limit for your systems to limit the output of a PSU and reduce system power consumption. Dell is the first hardware vendor to leverage Intel Node Manager for circuit-breaker fast capping.
Systems management (redundant PSU only)	**iDRAC7 Enterprise** provides server-level management that monitors, reports, and controls power consumption at the processor, memory, and system level. **Dell OpenManage Power Center** delivers group power management at the rack, row, and data center level for servers, power distribution units, and uninterruptible power supplies.

Feature	Description
Active power management (redundant PSU only)	**Intel Node Manager** is an embedded technology that provides individual server-level power reporting and power limiting functionality. Dell offers a complete power management solution comprised of Intel Node Manager accessed through Dell iDRAC Enterprise and OpenManage Power Center that allows policy-based management of power and thermals at the individual server, rack and data center level. **Hot spare** reduces power consumption of redundant power supplies. **Thermal control of fan speed** optimizes the thermal settings for your environment to reduce fan consumption and lower system power consumption. **Idle power** enables Dell servers to run as efficiently when idle as when at full workload.
Fresh Air cooling (redundant PSU only)	With the thermal design and reliability of Dell products, you can have the capability to operate at excursion-based temperatures beyond the industry standard of 35°C (95°F) without impacting your availability model. This solution takes into account servers, networking, storage, and other infrastructure. Find additional information at Dell.com/FreshAir.
Rack infrastructure	Dell offers some of the industry's highest-efficiency power infrastructure solutions, including: • Power distribution units (PDUs) • Uninterruptible power supplies (UPS) • Energy Smart containment rack enclosures Find additional information at http://content.dell.com/us/en/enterprise/power-and-cooling-technologies-components-rack-infrastructure.aspx.

Find additional information at Dell.com/PowerAndCooling and Power.com/PowerCenter.

Power supply units

Energy Smart power supplies (redundant PSUs only) have intelligent features, such as the ability to dynamically optimize efficiency while maintaining availability and redundancy. Also featured are enhanced power-consumption reduction technologies, such as high-efficiency power conversion and advanced thermal-management techniques, and embedded power-management features, including high-accuracy power monitoring.

The R520 supports a power supply subsystem that consists of either a single (non-redundant) power supply or up to two AC-DC/DC-DC, hot-plug, redundant power supplies. The power supply provides +3.3V/5V/12V and +12Vaux for non-redundant design and provides 12V and 12Vaux for redundant design. There are several voltage regulators in the system to supply different voltage levels needed by different logic devices. A redundant system, which is managed through a PMBus interface, consists of two power supplies with 1 + 1 redundancy, auto-sensing, and auto-switching capability.

The following power supply options are available for the R520:

- 495W AC, hot-plug redundant
- 550W AC, non-redundant
- 750W AC, hot-plug redundant
- 1100W AC, hot-plug redundant
- 1100W DC, hot-plug redundant

Figure 7 shows a 750W power supply unit extended from the R520 chassis.

Figure 7. 750W power supply unit

Dell PSUs have achieved Platinum efficiency levels as shown in Table 16.

Table 16. Power supply efficiency

Form factor	Output	Class	Efficiency targets by load			
			10%	20%	50%	100%
Redundant 86mm	495W AC	Platinum	82.0%	90.0%	94.0%	91.0%
	750W AC	Platinum	82.0%	90.0%	94.0%	91.0%
	1100W AC	Platinum	89.0%	93.0%	94.5%	92.0%
	1100W DC	N/A	80.0%	88.0%	91.0%	88.0%
Cabled	550W AC	Silver	N/A	85.0%	88.0%	85.0%

Thermal and acoustics

Optimized thermal management makes the PowerEdge R520 cool and quiet. Benefiting from smart cooling fan speed control, the R520 can keep both high performance and good acoustics across a wide range of ambient temperatures from 10°C to 35°C (50°F to 95°F) and to extended ambient temperature ranges (see Table 25). Operating environments for the R520 can vary from the data center to general-use spaces. In a typical configuration, the R520 is suitable for an open office environment.

Thermal design

The thermal design of the PowerEdge R520 reflects the following:

- **Multiple sensors are monitored for thermal feedback control:** The PowerEdge R520 dynamically controls system cooling fan speed based on responses from all component temperature sensors, including processors, hard disk drives, DIMMs, storage cards, and the inlet ambient temperature. Thermal control detects and responds to hardware configuration. Thermal management adjusts cooling according to what the system really needs, and draws lower fan power draw and generates lower acoustical noise levels than servers without such controls.

- **User-configurable settings:** An R520 thermal control design target is to minimize the contribution of fan power to overall system power. However, with the understanding and realization that every customer has a unique set of circumstances or expectations of the system, in this generation of servers, we are introducing limited user-configurable settings in the iDRAC7 BIOS setup screen. For more information, see the *Dell PowerEdge R520 Systems Owner's Manual* on Support.Dell.com/Manuals and "Advanced Thermal Control: Optimizing across Environments and Power Goals" on Dell.com.
- **Fan fault tolerance:** Continuous operation with one motor failure in the system. The R520 base configuration has four fans. An additional fan (Fan 1) is required if redundant power supplies are used, and another fan is required if a second processor is used (Fan 6). R520 supports fan fault tolerance for all six fans. The fault tolerance feature allows one motor fan to fail at a time allowing a fan replacement within 360 hours of a fan failure.
- **Cooling redundancy:** The R520 allows continuous operation with a fan failure in the system. The base configuration of the R520 has four fans. Additional fans are needed when using redundant power supplies and a second processor. The R520 supports fault-tolerant cooling for all six fans.
- **Environmental specifications:** The optimized thermal management makes the R520 reliable under a wide range of operating environments as shown in the environmental specifications in Table 25. Many configurations are also compliant under expanded operating temperature environments, but a few are not.

Acoustical design

The acoustical design of the PowerEdge R520 reflects the following:

- **Versatility:** The PowerEdge R520 saves you power draw in the data center, but it also is quiet enough for the office environment in typical and minimum configurations. Compare the values for LpA in Table 17 for these configurations, and note that they are lower than ambient measurements of typical office environments.
- **Adherence to Dell's high sound quality standards:** Sound quality is different from sound power level and sound pressure level in that it describes how humans respond to annoyances in sound, like whistles and hums. One of the sound quality metrics in the Dell specification is prominence ratio of a tone, which is listed in Table 17.
- **Noise ramp and descent during bootup from power off:** Fan speeds and noise levels ramp during the boot process (from power off to power on) in order to add a layer of protection for component cooling in the case that the system were not to boot properly. To keep bootup as quiet as possible, the fan speed reached during bootup is limited to about half of full speed.
- **Noise level dependencies:** If acoustics is important to you, you may want to make the following configuration choices and settings for the PowerEdge R520 for quieter operation:
  - In the BIOS, select the power-optimized DAPC rather than performance-optimized for the system thermal profile
  - Turn hot spare feature off in PSU
  - Since hard drive noise is highly dependent on spindle speed, the 7200-rpm SATA hard drive will have the quietest hard drive operation

  However, some components cause significant but not necessarily intuitive increases in loudness when they are installed in the R520. Contributors to acoustical output can include:
  - More than one processor
  - Number of DIMMs
  - PERC H710 mini, PERC H710P mini, or PERC H810

Table 17 details the acoustical performance for the R520.

Table 17. Acoustical performance

Configuration (23 ± 2°C ambient)	CPUs	Hard drives	Power supply unit	Memory	PCI card/HDD controller	Operating mode	L_{WA}-UL[1] (bels)	L_{pA}[2] (dBA)	Prominent tones[3]
Typical	2	6 x 2.5" 600GB SAS (10K)	2 x 750W	6 x 4GB 1333Hz	1 x Dual Port 1GbE NIC 1 x PERC H710 mini	Idle[4]	5.4	34	None
						Stress[5]	5.4	34	None
Maximum	2	8 x 3.5" 600GB SAS (15K)	2 x 750W	12 x 32GB 1333Hz	2 x Quad Port 1GbE NIC 1 x FC8 1 x PERC H710P mini 1 x PERC H810	Idle[4]	5.8	39	None
						Stress[5]	5.9	41	None

[1] L_{WA}-UL is the upper limit sound power levels (L_{WA}) calculated per section 4.4.1 of ISO 9296 (1988) and measured in accordance to ISO 7779 (2010).

[2] L_{pA} is A-weighted sound pressure level at front bystander position measured by binaural head in accordance with ISO7779 (2010) Section 8.6.2. The system is placed inside rack in 75 cm height.

[3] Prominent tone: Criteria of D.6 and D.11 of ECMA-74 11th ed. (2010) are followed to determine if discrete tones are prominent. The system is placed inside rack in 75 cm height and acoustic transducer, binaural head, is at front bystander position, ref ISO7779 (2010) Section 8.6.2.

[4] Idle: Reference ISO 7779 (2010) definition 3.1.7; system is running in its operating system but no other specific activity.

[5] Stress: An operating mode per ISO 7779 (2010) definition 3.1.6. The software SPECPower at 50% is activated to stress the processors and DIMM.

For more information on Dell's acoustical design, see the Dell Enterprise Acoustics white paper.

9 Rack rails and cable management

The sliding and static rail systems for the Dell PowerEdge R520 provide tool-less support for 4-post racks with square or unthreaded round mounting holes. Both rail systems also support tooled mounting in 4-post threaded racks, and the static rails support tooled mounting in 2-post (Telco) racks as well for added versatility.

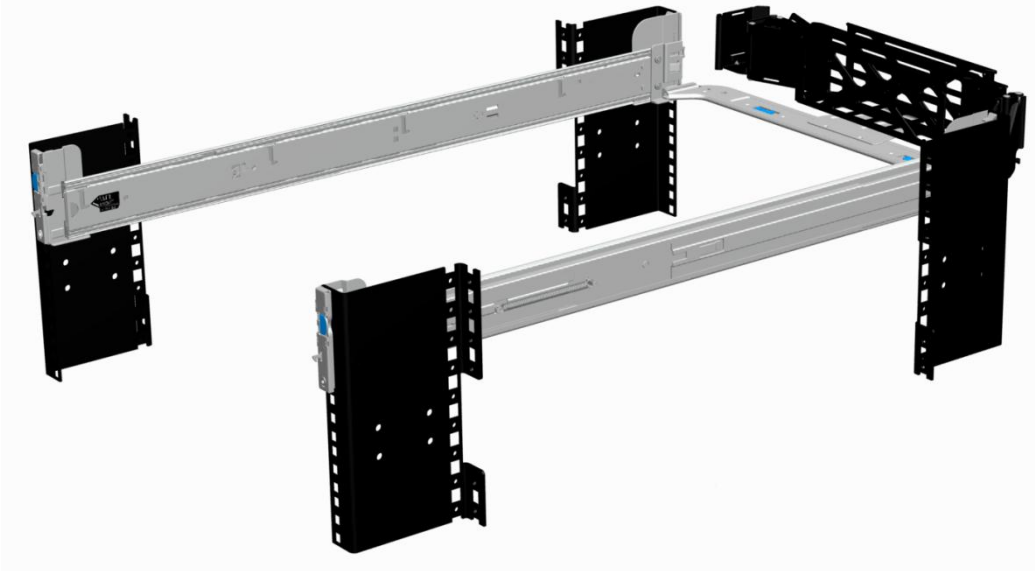
Compared to the R510 sliding rails that required the use of adapter brackets, the sliding rails for the R520 now offer support for threaded hole racks with the ReadyRails II mounting interface. The optional cable management arm (CMA) can be mounted on either the left or right side of the sliding rails without the use of tools for fast and easy deployment. The R520 is backward compatible with the R510 rails and CMA.

Sliding and static rail systems

The R520 supports both sliding rails and static rails. Both rails have a new slim rail design that supports the wide system chassis. The rails ship in the tool-less mounting configuration, but can be converted to the tooled configuration very quickly and easily.

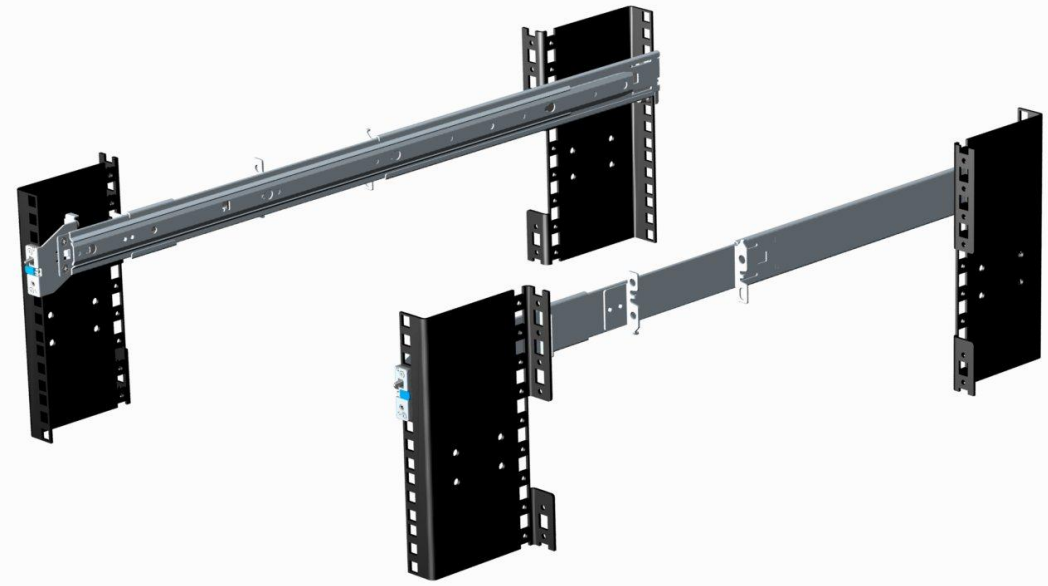
Sliding rails include a self-adjusting feature to allow the rails to be shared across multiple systems and accommodate various chassis depths. The sliding rail system allows you to fully extend the server out the rack for easy access for service. The sliding rails are available with or without the optional CMA. Figure 8 shows the sliding rails with the CMA.

Figure 8. Sliding rails with optional CMA



The static rails (shown in Figure 9) support a wider variety of racks than the sliding rails but do not support serviceability in the rack and are therefore are not compatible with the CMA.

Figure 9. Static rails



One key factor in selecting the proper rails is identifying the type of rack in which they will be installed. Both the sliding rails and the static rails support tool-less mounting in 19"-wide, EIA-310-E compliant square hole and unthreaded round hole 4-post racks. Both also support tooled mounting in threaded hole 4-post racks, but only the static rails, as the more universal solution, support mounting in 2-post (Telco) racks.

Table 18 lists the rack types that the R520 supports.

Table 18. Supported rack types

Product	Rail Identifier	Mounting Interface	Rail Type	Rack Types Supported				
				4-Post			2-Post	
				Square	Round	Thread	Flush	Center
R520	B6	ReadyRails II	Sliding	✓	✓	✓	X	X
	B4	ReadyRails	Static	✓	✓	✓	✓	✓

Screws are not included in either kit due to the fact that threaded racks are offered with a variety of thread designations. You must provide your own screws when mounting the rails in threaded racks Screw head diameter for the sliding rails must be 10 mm or less.

Other key factors governing proper rail selection include the spacing between the front and rear mounting flanges of the rack, the type and location of any equipment mounted in the back of the rack such as power distribution units (PDUs), and the overall depth of the rack. Due to their reduced complexity and lack of need for CMA support, the static rails offer a greater adjustability range and a smaller overall mounting footprint than the sliding rails.

For detailed information about static and sliding rails, see the Rack rail specifications section in Appendix A. For more information on installing the R520 in a rack, see the *Rack Installation Instructions* on Support.Dell.com/Manuals.

Cable management arm

The optional CMA organizes and secures the cords and cables exiting the back of the server and unfolds to allow the server to extend out of the rack without having to detach the cables. Some key features of the R520 CMA include:

- Large U-shaped baskets to support dense cable loads
- Open vent pattern for optimal airflow
- Ability to be mounted on either side
- Use of hook-and-loop straps rather than plastic tie wraps to eliminate the risk of cable damage during cycling
- Low-profile fixed tray to both support and retain the CMA in its fully closed position
- Ability to mount the CMA and tray without the use of tools, due to snap-in designs

10 Operating systems and virtualization

The Dell PowerEdge R520 supports a wide range of industry-standard operating systems and virtualization software.

Supported operating systems

Table 19 lists the primary operating systems supported on the R520. For the latest information on supported operating systems, see Dell.com/OSsupport.

Table 19. Primary operating system support

Operating System	Platform	Edition
Red Hat Enterprise Linux 5.8[1]	x32 x64	N/A
Red Hat Enterprise Linux 6.2[2]	x64	N/A
SUSE Linux Enterprise Server 11 SP2	x64	N/A
SUSE Linux Enterprise Server 10 SP4	x64	N/A
Microsoft Windows Server 2008 R2 with SP1	x64 (with Hyper-V role enabled)	Web Standard Enterprise Datacenter
Microsoft Windows Small Business Server 2011	x64	Standard Premium Add-on

[1]RHEL 5.7 is the minimum supported version. Current drop in box option is RHEL 5.8.
[2]RHEL 6.1 is the minimum supported version. Current factory install is RHEL 6.2.

Supported virtualization

One of the key features for virtualization on the PowerEdge R520 is the support for a fail-safe hypervisor. By running a hypervisor on an optional SD card and installing a backup copy on the other mirrored SD card, you can protect against hardware failure and maximize virtualization uptime.

Table 20 highlights the virtualization support for the R520.

Table 20. Virtualization support

Operating systems		Version	Options
Vmware[1]	vSphere v4.1 U2	ESX Classic	DIB
	vSphere v4.1 U2	ESXi Installable	DIB
	vSphere v4.1 U2	ESXi Embedded	FI
	vSphere v5.0	ESXi (one version)	FI/DIB
	vSphere v5.0 U1	ESXi (one version)	FI/DIB
Citrix	XenServer 6.0	N/A	DIB
Red Hat[2]	Enterprise Virtualization 3.0	N/A	DIB

FI = factory install; DIB = drop in box
[1]vSphere Fault Tolerance is supported with these versions
[2]No OpenManage support; drop in box license registration card only.

11 Dell OpenManage systems management

Whether your IT environment consists of a few servers or a few thousand servers, Dell OpenManage systems management solutions provide comprehensive management for evolving IT environments. OpenManage is based on open standards and provides agent-based and agent-free server lifecycle management functionality for Dell PowerEdge servers. OpenManage solutions help you automate and streamline essential hardware management tasks.

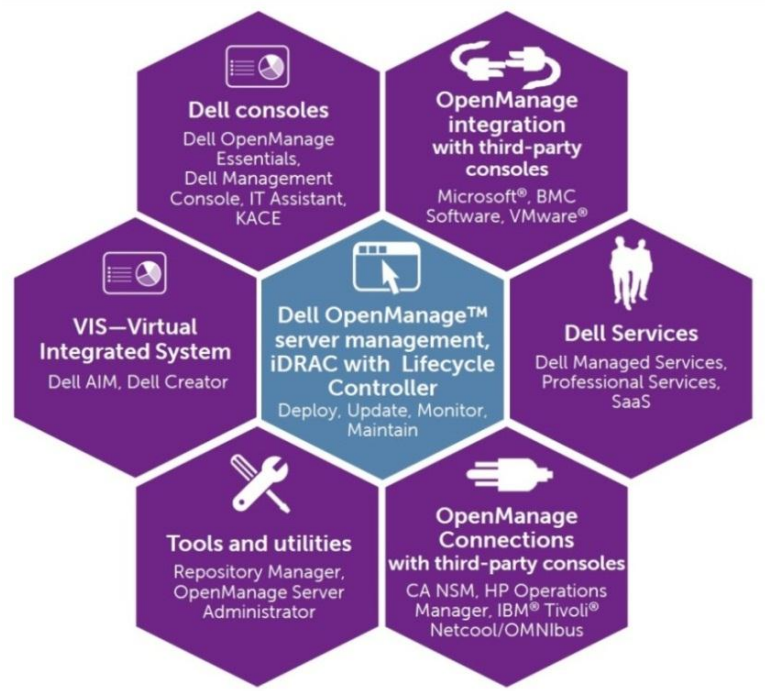
The advanced management capabilities of Dell OpenManage also integrates into offerings from other popular systems management solutions that you may already use, making Dell platforms easy to manage and deploy in any IT environment. This ensures your IT services are available when your business needs them. If you have already standardized on offerings from industry leaders, such as BMC Software, Microsoft, Symantec™, VMware, or other vendors, you can leverage OpenManage integration and connections developed to use with your existing systems management framework to efficiently manage Dell servers, storage, business-client PCs, and network devices.

Start with a firm foundation for efficient hardware management using OpenManage tools, utilities, and management consoles. OpenManage systems management solutions consist of a combination of embedded management features and software products that help you automate and simplify the entire server lifecycle: deploy, update, monitor, and maintain. OpenManage solutions are innovatively designed for simplicity and ease of use to help you reduce complexity, save time, achieve efficiency, control costs, and empower productivity.

Systems management solutions

Dell systems management solutions include a wide variety of tools, products, and services that enable you to leverage an existing systems management framework. As shown in Figure 10, Dell systems management solutions are centered around OpenManage server management, featuring iDRAC with Lifecycle Controller.

Figure 10. Dell systems management solutions


Dell consoles
Dell OpenManage Essentials, Dell Management Console, IT Assistant, KACE
OpenManage integration with third-party consoles
Microsoft®, BMC Software, VMware®
VIS—Virtual Integrated System
Dell AIM, Dell Creator
Dell OpenManage™ server management, iDRAC with Lifecycle Controller
Deploy, Update, Monitor, Maintain
Dell Services
Dell Managed Services, Professional Services, SaaS
Tools and utilities
Repository Manager, OpenManage Server Administrator
OpenManage Connections with third-party consoles
CA NSM, HP Operations Manager, IBM® Tivoli® Netcool/OMNIbus

OpenManage systems management

The Dell OpenManage systems management portfolio includes powerful hardware and software management tools and consoles. OpenManage simplifies the lifecycle of deploying, updating, monitoring, and maintaining your Dell PowerEdge servers.

iDRAC7 with Lifecycle Controller

The Integrated Dell Remote Access Controller 7 (iDRAC7) with Lifecycle Controller is the heart of the second generation of Dell PowerEdge server embedded management functionality. In addition to enabling agent-free management, iDRAC7 with Lifecycle Controller provides remote access to the system—whether or not there is a functioning operating system running on the server. These embedded features improve all aspects of a typical server lifecycle. Table 21 describes the functions and benefits of iDRAC7 with Lifecycle Controller.

Table 21. iDRAC7 with Lifecycle Controller functions and benefits

Feature	Function	Benefit
Out of band (OOB)	iDRAC7 offers real-time OOB discovery, inventory, deployment monitoring, alerting and updates for servers and internal storage	Manage servers independent of the OS type or status—even if an OS is not installed
Single code base	All server types have the same embedded management hardware and firmware	Simplified and consistent maintenance across server platforms
Dedicated GigE port (PowerEdge rack and tower systems)	Gigabit Ethernet replaces 10/100 on predecessor iDRAC6	Fast throughput for better performance; compatibility with setup for switches
Email alerts	Simplified, more informative, and expanded coverage than previous versions of iDRAC	More detail allows IT administrators to be more efficient in diagnosing and remediating an issue; alerts include a direct, embedded URL in the email notification to further speed resolution
vFlash media	Enabled with iDRAC7 Enterprise	Allows for use of a non-Dell SD card
Enhanced power management	Integration with Intel Node Manager provides data center level power monitoring and capping (requires iDRAC7 Enterprise)	Fine tune data center power policies, capping, and usage; report on historical power usage by rack, row or room using Power Center Manager (new)

Feature	Function	Benefit
Electronic licensing	Upgrades to iDRAC7 Express or iDRAC7 Enterprise by software licensing key and license portal (may require installation of hardware option for 200-500 series servers)	If iDRAC7 Express or iDRAC7 Enterprise is ordered during initial point of sale, license key is installed. If Basic Management is ordered during initial point of sale, customer must request a license key through the Dell Licensing Portal. For most server models, embedded server management and electronic licensing enables feature enhancements that do not require installation of additional hardware or system downtime.

Feature comparison

The systems management default for the R520 is basic management with an upgrade option for iDRAC7 Express or iDRAC7 Enterprise. A detailed feature comparison of basic management, iDRAC7 Express, and iDRAC7 Enterprise is shown in Table 22.

Table 22. Feature comparison for basic management, iDRAC7 Express, and iDRAC7 Enterprise

Feature (function)	Basic management	iDRAC7 Express	iDRAC7 Enterprise
Local configuration with Lifecycle Controller GUI	•	•	•
IPMI 2.0	•	•	•
Embedded diagnostics	•	•	•
Local OS install	•	•	•
Local updates	•	•	•
Driver pack	•	•	•
Shared NIC (LOM)[1]	•	•	•
Remote update	•[2]	•	•
Power control	•[2]	•	•
Power monitoring		•	•
Encryption		•	•
IPv6		•	•
Auto-discovery		•	•
Auto-recovery		•	•
Web GUI		•	•

Feature (function)	Basic management	iDRAC7 Express	iDRAC7 Enterprise
Remote CLI		•	•
Local/SSH CLI		•	•
Serial redirection		•	•
Remote config		•	•
Email alerts		•	•
SNMP alerts		•	•
Comprehensive monitoring		•	•
Crash screen capture[3]		•	•
Dedicated NIC 1Gbps (100MB in iDRAC6)			•[4]
Part replacement			•
Backup and restore configurations			•
Virtual console (4 user)			•
Virtual console chat			•
Support for customer supplied SD cards for vFlash media			•
Virtual flash partitions			•
Virtual media			•
Virtual folders			•
Remote file share			•
Crash video playback			•
Boot record/playback			•
Power capping			•
Enterprise group power management			•
Directory services (AD, LDAP)			•
PK authentication			•
Two-factor authentication[4]			•

[1]Rack and tower systems only
[2]Feature available with IPMI, not web GUI
[3]Requires OMSA agent on target server
[4]Uses Microsoft® ActiveX® on Internet Explorer® only

Agent-based management

Most systems management solutions require pieces of software, called agents, to be installed on each node in order to be managed within the IT environment. Additionally, the same agent is often used as a local interface into the hardware health and may be accessed remotely as a management interface, typically referred to as a one-to-one interface. For customers that continue to use agent-based solutions, Dell provides OpenManage Server Administrator.

OpenManage Server Administrator

The Dell OpenManage Server Administrator (OMSA) agent gives you a comprehensive, one-to-one systems management solution for both local and remote servers and their storage. OMSA can help simplify single-server monitoring with a secure command-line interface (CLI) or Web-based management graphical user interface (GUI). It can also be used to view system configuration, inventory, health, and performance.

Agent-free management

Because Dell PowerEdge servers have embedded server lifecycle management, in many cases, there is no need to install an OpenManage systems management software agent into the operating system of a Dell PowerEdge server. This greatly simplifies and streamlines the management footprint.

Dell consoles

The central console in a systems management solution is often referred to as the one-to-many console. The central console provides a rapid view and insight into the overall health of all systems in the IT environment. The Dell systems management portfolio includes several powerful consoles, depending upon your needs, including the following:

- **Dell OpenManage Essentials**—OpenManage Essentials (OME) is a recently released systems management console that provides a comprehensive view of Dell systems, devices, and components in an enterprise network. It is used to monitor Dell PowerEdge servers, EqualLogic™ and PowerVault™ storage, and PowerConnect™ switches; to update and configure Dell servers; and to create asset reports. OpenManage Essentials also communicates health status alerts for Dell servers, storage, and network devices to the Dell KACE™ K1000 service desk. OpenManage Essentials is available as a no-charge software download from Support.Dell.com.
- **Dell Management Console**—Dell Management Console (DMC) offers sophisticated data center management capabilities with comprehensive reporting features. DMC can perform basic hardware management and can manage operating systems and applications using various plug-ins from Symantec.
- **Dell IT Assistant**—Dell IT Assistant (ITA) is a console for managing Dell servers, storage arrays, and other components distributed throughout a network. Dell IT Assistant allows for easy identification of system issues through alerts, helping to reduce system downtime. Systems administrators can easily monitor systems anywhere within their network using ITA. ITA is supported on the R520, however, enhanced functionality is now available with OpenManage Essentials.

OpenManage systems management tools and utilities

Dell OpenManage systems management tools and utilities consist of the following:

- **Dell Repository Manager**—The Dell Repository Manager (RM) is a standalone GUI-based productivity tool that helps simplify the process of managing downloads and baseline BIOS, firmware, and driver updates. Repository Manager can create deployment disks as well as create and manage customized repositories.

- **Dell OpenManage Server Update Utility**—The Dell Server Update Utility (SUU) is a DVD-based application for identifying and applying BIOS and firmware updates to your Dell PowerEdge servers.
- **Dell OpenManage Systems Build and Update Utility**—The Dell System Build and Update Utility (SBUU) provides one-to-one and one-to-many deployment and single-server update capabilities in the pre-operating system environment.
- **Dell Update Packages**—The Dell Update Packages (DUP) is a self-contained executable in a standard package format that updates a software element on a Dell server such as the BIOS, a driver, firmware and other software updates.
- **Dell OpenManage Deployment Toolkit**—The Dell OpenManage Deployment Toolkit (DTK) is a CLI-based tool that includes a set of utilities for configuring and deploying Dell PowerEdge systems, and can be used to build scripted, unattended OS installations to deploy large numbers of servers in a reliable fashion.
- **RACADM**—The RACADM command-line utility provides a scriptable interface that allows you to locally or remotely configure iDRAC7.
- **IPMITool**—IPMITool includes scriptable console application programs used to control and manage remote systems using the IPMI version 1.5 and later protocol.

Integration with third-party consoles

Dell OpenManage easily integrates with several leading third-party consoles, including:

- **Dell Server Management Pack Suite for Microsoft System Center Operations Manager (SCOM)**—This suite of server management packs enables several functions through System Center Operations Manager, including in-band discovery and monitoring of racks and towers, out-of-band discovery and monitoring through iDRAC with Lifecycle Controller, as well as performance and advanced monitoring.
- **Dell Lifecycle Controller Integration (DLCI) for Microsoft System Center Configuration Manager (SCCM)**—This pack contains Dell Lifecycle Controller Integration (DLCI), which integrates OpenManage functions in SCCM to manage the Dell PowerEdge servers, including auto-discovery, operating system deployment and configuration of hardware elements, (RAID, NIC, BIOS, iDRAC), OS and hypervisor agnostic updates, firmware management, and system viewer utilities.
- **Dell Server PRO Management Pack for Microsoft System Center Virtual Machine Manager (SCVMM)**—This pack manages Dell physical servers and hosts of virtual machines (VMs) by using Microsoft System Center Operations Manager/System Center Essentials (SCOM/SCE) and System Center Virtual Machine Manager (SCVMM). It provides guidance for remedial actions based on alerts to best manage virtual machines and handle the impacts appropriately.
- **Dell Management Plug-in for VMware vCenter**—This plug-in allows IT administrators to monitor, provision, and manage the physical PowerEdge server hardware and firmware from a dedicated Dell menu accessed through the VMware vCenter console using the same role-based access control model as vCenter, combining physical server management.
- **BMC Software**—Dell and BMC Software work together to simplify IT by ensuring tight integration between Dell server, storage, and network management functionality and the BMC Software process and data center automation products.

OpenManage connections with third-party consoles

Dell OpenManage provides connections with many third-party consoles, including:

- **Dell OpenManage Connection for Computer Associates Network and Systems Management**—This connection allows you to monitor PowerEdge servers and PowerVault storage arrays from within the Computer Associates Network and Systems Management (CA NSM) console.
- **Dell OpenManage Connection for HP Operations Manager**—This connection enables several functions through HP Operations Manager, including auto-grouping, SNMP trap reception, global health monitoring, and a context-sensitive launch of OpenManage Server Administrator.
- **Dell OpenManage Connection for IBM Tivoli Netcool/OMNIBus**—This connection provides event monitoring capabilities to monitor Dell PowerEdge servers and Dell EqualLogic systems. It allows event monitoring, automatic event correlation, and launching device consoles from the Netcool/OMNIbus console.

Dell server management operations

Dell OpenManage systems management is centered on automating the server management lifecycle—deploy, update, monitor, and maintain. To manage an infrastructure properly and efficiently, you must perform all of these functions easily and quickly. iDRAC7 with Lifecycle Controller technology provides you with these intelligent capabilities embedded within the server infrastructure. This allows you to invest more time and energy on business improvements and less on maintenance. Figure 11 illustrates the various operations that can be performed during the server's lifecycle.

Figure 11. Systems management server lifecycle

Table 23 lists the products that are available for one-to-one and one-to-many operations, and when they are used in the server's lifecycle.

Table 23. One-to-one and one-to-many operations

Operation	One-to-one	One-to-many	
Deploy	• Lifecycle Controller GUI • DTK • SBUU	• Symantec Deployment Server • Dell Management Plug-in for VMware vCenter • KACE K1000 Appliance • Lifecycle Controller Remote Services • BMC BladeLogic integration with Lifecycle Controller	• Dell Server Deployment Pack (DSDP) for Microsoft System Center Configuration Manager and Dell Lifecycle Controller Integration (DLCI) for Microsoft System Center Configuration Manager
Update	• iDRAC7 with LifeCycle Controller • Lifecycle Controller GUI • Repository Manager • DUP • SUU • SBUU • Dell Management Plug-in for VMware vCenter	• Dell OpenManage Essentials • Dell OpenManage ITA • Dell Management Console • Lifecycle Controller Remote Services	• Dell Update Catalogs for Microsoft System Center Configuration Manager • Dell Lifecycle Controller Integration (DLCI) for Microsoft System Center Configuration Manager
Monitor	• iDRAC7 • OMSA	• Dell OpenManage Essentials • Dell OpenManage ITA • BMC ProactiveNet Performance Management • Dell OpenManage Power Center • Dell Management Console	• Dell Management Plug-in for VMware vCenter • BMC ProactiveNet • Dell Server Management Pack Suite for Microsoft System Center Operations Manager (SCOM)
Maintain	• IPMI • iDRAC7 • Lifecycle Controller GUI	• Lifecycle Controller Remote Services	Remediate: • Dell Server PRO Management Pack for Microsoft System Center Virtual Machine Manager (SCVMM) Replace parts: • Dell Lifecycle Controller Integration (DLCI) for Microsoft System Center Configuration Manager

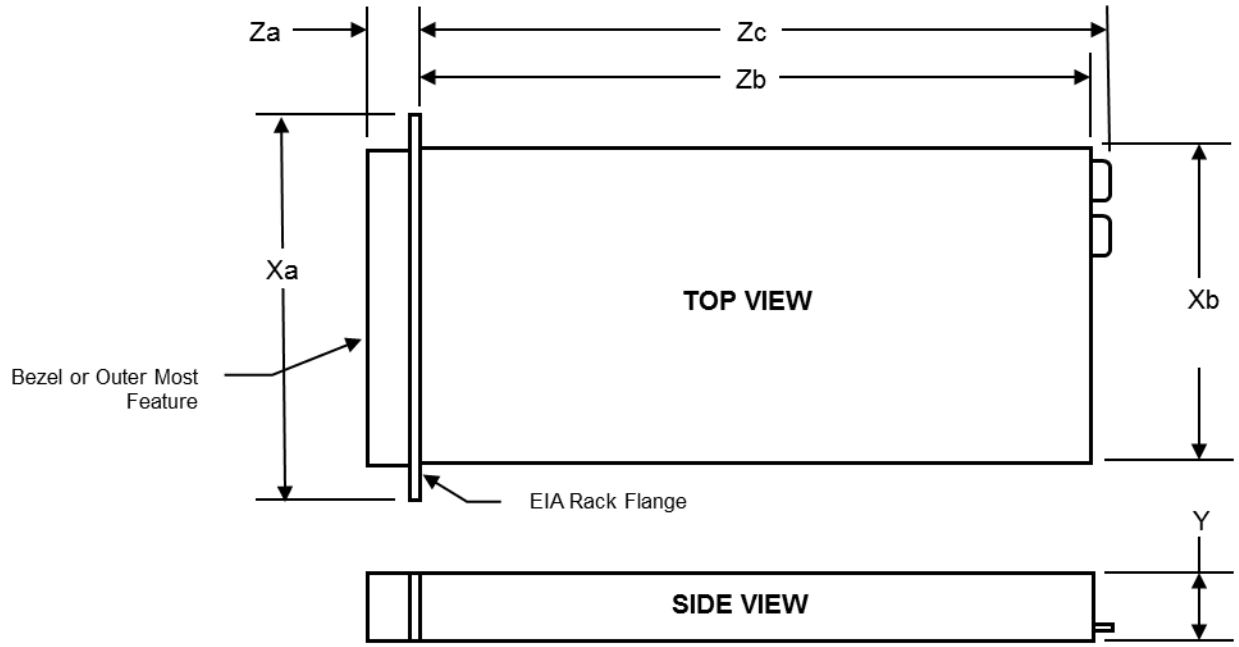
For additional detailed information on Dell's systems management portfolio, see the *Dell Systems Management Overview Guide* on Support.Dell.com/Manuals.

Appendix A. Additional specifications

Chassis dimensions

Figure 12 details the dimensions of the Dell PowerEdge R520 chassis.

Figure 12. System dimensions



Xa	Xb	Y	Za with bezel	Za without bezel	Zb[1]	Zc
482.4mm	434.0mm	86.8mm	35mm	20.1mm	611.1mm	631.7mm with cabled PSU 649.1mm with redundant PSU

[1]Zb goes to the nominal back wall external surface where the system board I/O connectors are located.

Chassis weight

The R520 chassis at maximum configuration is 28.2 kg (62 lb).

Power supply specifications

Table 24 lists power supply specifications for the PowerEdge R520.

Table 24. Power supply specifications

Specification	495W AC	550W AC	750W AC	1100W AC	1100W DC
Current consumption	6.5A–3A	7.4A–3.7A	10A–5A	12A–6.5A	32A (X2)
Supply voltage	100–240 VAC[1]	100–240 VAC[1]	100–240 VAC[1]	100–240 VAC[1]	-48V to -60 VDC
Frequency	50/60Hz	50/60Hz	50/60Hz	50/60Hz	N/A
Heat dissipation (BTU/hr max)	1908	2315	2891	4100	4416

[1]Auto-ranging

Environmental specifications

Table 25 details the environmental specifications for the R520. For additional information about environmental measurements for specific system configurations, see Dell.com/environmental_datasheets.

Table 25. Environmental specifications

Fresh Air: temperature, humidity, altitude de-rating	
Continuous operation	10°C to 35°C (50°F to 95°F) at 10% to 80% relative humidity with 26°C (78.8°F) maximum dew point (maximum wet bulb temperature). De-rate maximum allowable dry bulb temperature at 1°C per 300m above 950m (1°F per 547 ft above 3117 ft).
Expanded operation	When operating in the expanded temperature range, system performance may be impacted, and ambient temperature warnings may be reported on the LCD and in the System Event Log. **≤ 10% of annual operating hours:** 5°C to 10°C and 35°C to 40°C (with no direct sunlight on the equipment) at 5% to 85% relative humidity with 26°C dew point (maximum wet bulb temperature). Outside the standard operating temperature (10°C to 35°C), the system can operate down to 5°C or up to 40°C for a maximum of 10% of its annual operating hours. For temperatures between 35°C and 40°C (95°F to 104°F), de-rate maximum allowable dry bulb temperature by 1°C per 175m above 950m (1°F per 319 ft above 3117 ft). **≤ 1% of annual operating hours:** –5°C to 5°C and 40°C to 45°C (with no direct sunlight on the equipment) at 5% to 90% relative humidity with 26°C dew point (maximum wet bulb temperature). Outside the standard operating temperature (10°C to 35°C), the system can operate down to –5°C or up to 45°C for a maximum of 1% of its annual operating hours. For temperatures between 40°C and 45°C (104°F to 113°F), de-rate maximum allowable dry bulb temperature by 1°C per 125m above 950m (1°F per 228 ft above 3117 ft). **Expanded operation restrictions:** • System must have six fans • Processors not supported: 130W, 4-core processors, 135W processors, Intel Core processors • Non-redundant power supplies not supported • Non Dell-qualified peripheral cards and/or cards greater than 25W are not supported

Temperature	
Operating	See Fresh Air for temperature information
Storage	–40°C to 65°C (-40°F to 149°F) with a maximum temperature gradation of 20°C per hour
Relative humidity	
Operating	See Fresh Air for relative humidity information
Storage	5% to 95% at a maximum wet bulb temperature of 33°C (91°F); atmosphere must be condensing at all times
Maximum vibration	
Operating	0.26 Grms at 5Hz to 350Hz in all orientations
Storage	1.87 Grms at 10Hz to 500Hz for 15 minutes (all six sides tested)
Maximum shock	
Operating	Half sine shock in all operational orientations of 31G +/– 5% with a pulse duration of 2.6ms +/– 10%
Storage	Half sine shock on all six sides of 71G +/– 5% with a pulse duration of 2ms +/–10%; square wave shock on all six sides of 27G with velocity change at 235 in/sec or greater
Altitude	
Operating	–15.2m to 3048m (–50 ft to 10,000 ft)
Storage	–15.2m to 12,000m (–50 ft to 39,370 ft)
Airborne contaminant level	
Class G1 or lower as defined by ISA-S71.04-1985	

Video specifications

The Dell PowerEdge R520 iDRAC incorporates an integrated video subsystem. The graphics controller is the 2D Matrox® G200. The video frame buffer (16MB) is contained within the iDRAC RAM (256MB) device.

The R520 system supports the 2D graphics video modes listed in Table 26.

Table 26. Supported video modes

Resolution	Refresh Rate (Hz)	Color Depth (bit)
640 x 480	60, 70	8, 16, 32
800 x 600	60, 75, 85	8, 16, 32
1024 x 768	60, 75, 85	8, 16, 32
1152 x 864	60, 75, 85	8, 16, 32
1280 x 1024	60, 75	8, 16, 32

Rack rail specifications

Table 27 lists the spacing dimensions for the R520 sliding and static rails.

Table 27. Rail adjustability range

Product	Rail identifier	Rail type	Rail adjustability range (mm)						Rail depth (mm)	
			Square		Round		Threaded		without CMA	with CMA
			Min	Max	Min	Max	Min	Max		
R520	B6	Sliding	676	868	662	861	676	883	714	845
	B4	Static	608	879	594	872	604	890	622	—

The adjustment range of the rails is a function of the type of rack in which they are being mounted. The min-max values listed above represent the allowable distance between the front and rear mounting flanges in the rack. Rail depth without the CMA represents the minimum depth of the rails with the outer CMA brackets removed (if applicable) as measured from the front mounting flanges of the rack.

USB peripherals

USB peripherals are supported through the front and back USB ports on the R520. These ports are USB 2.0 compliant.

Appendix B. Standards compliance

The Dell PowerEdge R520 conforms to the industry standards listed in Table 28.

Table 28. Industry standard documents

Standard	URL for information and specifications
ACPI Advance Configuration and Power Interface Specification, v2.0c	www.acpi.info
Ethernet IEEE 802.3-2005	standards.ieee.org/getieee802/802.3.html
HDG Hardware Design Guide Version 3.0 for Microsoft Windows Server	www.microsoft.com/whdc/system/platform/pcdesign/desguide/serverdg.mspx
IPMI Intelligent Platform Management Interface, v2.0	www.intel.com/design/servers/ipmi
DDR3 Memory DDR3 SDRAM Specification, Rev. 3A	www.jedec.org/download/search/JESD79-3C.pdf
LPC Low Pin Count Interface Specification, Rev. 1.1	developer.intel.com/design/chipsets/industry/lpc.htm
PCI Express PCI Express Base Specification Rev. 2.0 and 3.0	www.pcisig.com/specifications/pciexpress
PMBus Power System Management Protocol Specification, v1.2	pmbus.info/specs.html
SAS Serial Attached SCSI, v1.1	www.t10.org
SATA Serial ATA Rev. 2.6; SATA II, SATA 1.0a Extensions, Rev. 1.2	www.sata-io.org
SMBIOS System Management BIOS Reference Specification, v2.7	www.dmtf.org/standards/smbios/
TPM Trusted Platform Module Specification, v1.2	www.trustedcomputinggroup.org
UEFI Unified Extensible Firmware Interface Specification, v2.1	www.uefi.org/specs
USB Universal Serial Bus Specification, Rev. 2.0	www.usb.org/developers/docs
Windows Logo Windows Logo Program System and Device Requirements, v3.10	www.microsoft.com/whdc/winlogo/hwrequirements.mspx

Appendix C. Additional resources

Table 29 provides a list of documents and websites that provide for more information on the Dell PowerEdge R520.

Table 29. Additional resources

Resource	Description of contents	Location
PowerEdge R520 Systems Owner's Manual	This manual is provided in HTML format on the CD provided with the R520 system, and also in HTML and PDF format at the Dell support site. A printed version is available in Asian languages as a customer-orderable option. This manual provides information on the following: • Chassis features • System Setup program • System messages • System codes and indicators • System BIOS • Remove and replace procedures • Troubleshooting • Diagnostics • Jumpers and connectors	Support.Dell.com/Manuals
PowerEdge R520 Getting Started Guide	This guide is printed and shipped with the system, and is also available in PDF format on the Dell support site. This guide provides information on the following: • Initial setup steps • Key system features • Technical specifications	Support.Dell.com/Manuals
Rack Installation Instructions	This printed document is provided with the rack kits. The document provides the instructions for installing the server in a rack.	Support.Dell.com/Manuals
Cable Management Arm Installation Instructions	This printed document is provided with the CMA kits. The document provides the instructions for installing the cable management arm on the rails.	Support.Dell.com/Manuals
Information Update	This document is printed and shipped with the system, and is also available in PDF format on the Dell support site. This document provides information on system updates.	Support.Dell.com/Manuals
System Information Label	The system information label documents the system board layout and system jumper settings. Text is minimized due to space limitations and translation considerations. The label size is standardized across platforms.	Inside the system chassis cover

Resource	Description of contents	Location
Quick Resource Locator (QRL)	This code on the chassis can be scanned by a phone application to access additional information and resources for the server, including videos, reference materials, service tag information, and Dell contact information.	Inside the system chassis cover
Dell Energy Smart Data Center Assessment	This tool uses infrastructure and thermal analysis to help maximize system efficiency.	Dell.com/EnergySmart
Energy Smart Solution Advisor	The Dell Energy Smart Solution Advisor (ESSA) enables easier and more meaningful estimates to help you determine the most efficient configuration possible. Use ESSA to calculate the power consumption of your hardware, power infrastructure, and storage.	Dell.com/ESSA
Power and cooling technologies	Provides details for improving energy efficiency in the data center.	Dell.com/PNC
Energy management	Provides information on Dell's Fresh Air cooling solutions.	Dell.com/FreshAir
Operating system matrix for Dell PowerEdge systems	Provides updated information on which operating systems are available on which PowerEdge systems.	Dell.com/OSsupport
Processor and chipset	Provides more information about the R520 processors and chipset.	Intel.com
Dell PowerEdge RAID controllers	Provides more information about Dell PERCs.	Dell.com/PERC
Power distribution unit	Provides help selecting a rack-based power distribution unit.	DellPDU.com
Uninterruptible power supply	Provides help selecting an uninterruptible power supply model.	DellUPS.com
Volatility information	Contact your Dell sales representative.	Dell.com
Dell Enterprise Acoustics	White paper that explores the mechanisms of, people's reaction to, language of, and Dell's work to control noise from Enterprise products.	www.dell.com/downloads/global/products/pedge/en/acoustical-education-dell-enterprise-white-paper.pdf

Appendix D. System board block diagram

Figure 13. R520 system board block diagram